that the ripe spores, with the upper end of the sterigmata, break off from the full grown sterigmata. There seems to be sufficient reason, therefore, for establishing the genus Neovossia.

**Neovossia Iowensis** Hume and Hodson, n. sp.—Spore mass filling the ovary, black; spores globose, subglobose, or ovate, brownish-black, opaque, 16×20 to 24×28 μ, enclosed in a hyaline capsule; appendage slender, hyaline, two or three times the length of the spore; epispore apparently pitted.

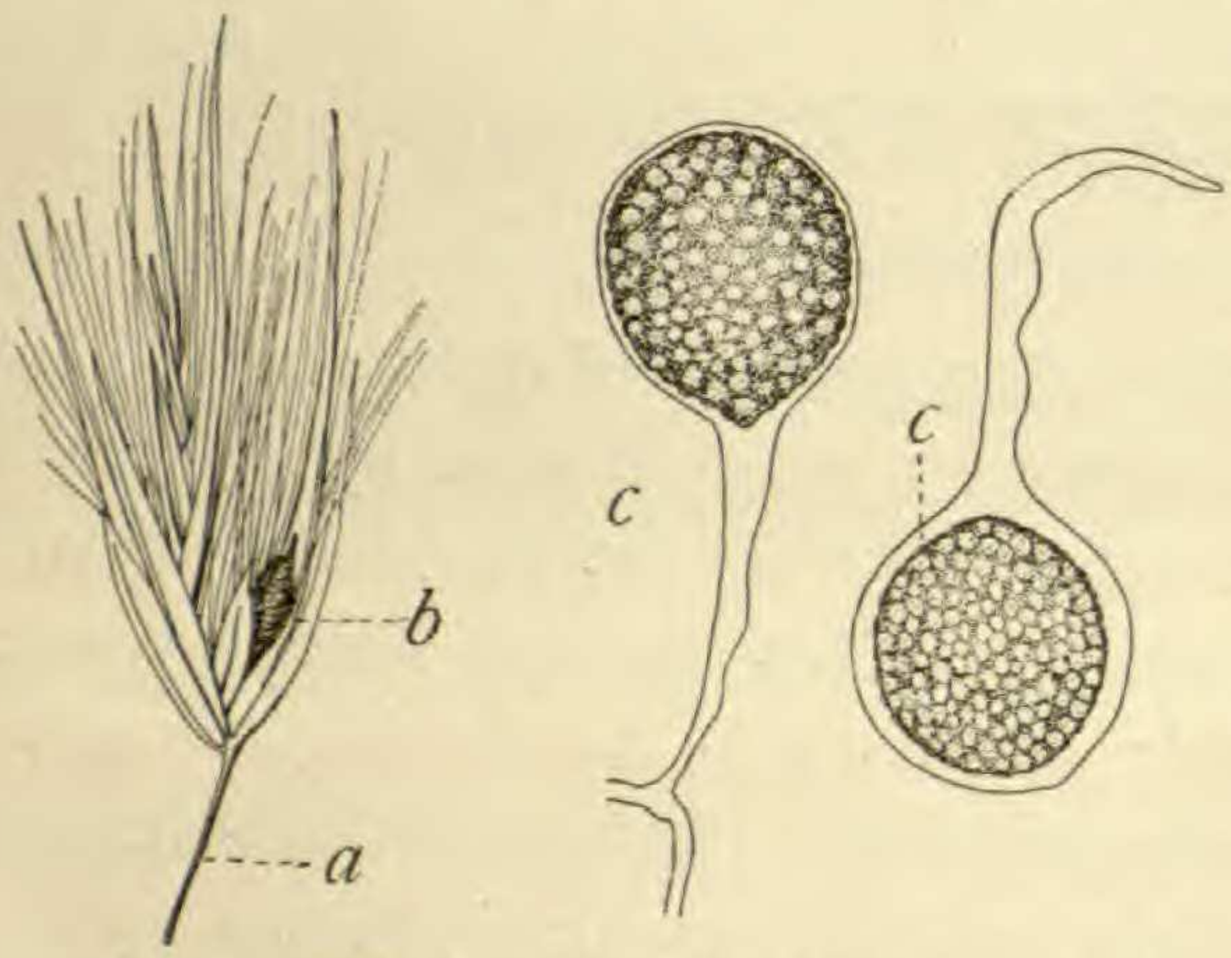


FIG. 1.—NEOVOSSIA IOWENSIS; *a*, spikelet of *Phragmites communis;* *b*, affected ovary; *c*, spores.

A careful comparison with specimen no. 1216 of von Thümen's *Mycotheca universalis* leads to the belief that the Iowa specimens are specifically distinct. The spores differ from those of *Neovossia Moliniae* (Thüm.) Körn. in being darker in color, broader and shorter, and generally blunter at the end opposite the appendage. The markings of the spore, also, are somewhat coarser. Ten spores of von Thümen's specimen, selected at random, gave an average of 27.7×17 μ, while the spores taken from the material collected at Colo, Iowa, gave 24.8×18.9 μ.—E. R. HODSON, *Ames, Iowa.*

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## NOTE ON THE ORIGIN OF TANNIN IN GALLS.[1]

THE origin of the different plant constituents is as much a mystery as their functions, and neither of these questions can be settled until more observations have been made. In considering the origin of tannin in galls the writer limits his observations for the present to the examinations of the common "ink-ball" or "ink-gall," which is produced on *Quercus coccinea* Wang., probably by *Cynips aciculata* O. S. The same kind of gall is produced on other oaks, as Mr. Beadle, of the Biltmore Herbarium, has sent me specimens which were produced on *Quercus imbricaria* Michx.

[1] Presented at the New York Meeting of the American Association for the Advancement of Science, June 1900.

I. These galls are produced during the summer months on the young branches and sometimes on acorns. When mature they fall from the trees and are nearly globular in shape, varying from 20–30$^{mm}$ in diameter. They are solid throughout and of the consistency of the pulp of a green apple. Externally they are smooth, and in color are a mottled green, yellow, and brownish-red. At this stage they are made up of three distinct zones: (1) a central zone, made up of nearly isodiametric parenchyma cells packed with numerous small somewhat spherical or irregular starch grains which are colored blue with iodine; (2) the middle zone, composed of radially elongated parenchyma cells, possessing thick cellulose walls with prominent simple pores and containing a mass of protoplasm lying on the sides of the walls and a few starch grains (with the development of the egg of the insect there also appear in the cells of the middle zone numerous starch grains closely resembling those found in the central zone); (3) an external layer made up of irregular parenchyma cells somewhat collenchymatic in character, with the protoplasm as in the middle zone.

II. Decided changes take place soon after the galls fall from the tree: (1) A larva develops in the central zone and there are signs of activity in the protoplasm of the cells of this zone. A large nucleus with nucleolus lies centrally in the protoplasm and in some cases yellowish globular vesicles are apparent. These latter are fixed in the fresh specimens by means of copper acetate (7 per cent. solution), after which treatment they become more yellowish in color and insoluble in water, chloral, glycerin, potassium hydrate, or alcohol, and are no doubt in the nature of tannin vacuoles. (2) In the galls which contain a larva, and have been allowed to remain in copper acetate solution for several weeks or months, there separate in the parenchyma cells of the middle layer or zone yellowish crystals or crystalline masses, which are insoluble in water, chloral, glycerin, or alcohol. These crystals and crystalline bodies are lens-shaped, star-shaped, or fan-shaped, and much resemble the different carbohydrates, as hesperidin, inulin, etc., which separate in certain plant cells when the specimens are placed in alcohol. These crystals, however, do not separate in alcoholic material, and are to be found only in galls which have been kept in copper acetate solution. Their appearance, reactions, and a comparison with copper gallate crystals lead to the conclusion that they are identical in composition with the latter salt. (3) In the external layer or zone of specimens which are at this stage of maturity,

and have been treated with copper acetate, reddish-brown, amorphous, or somewhat crystalline masses are found adhering to the walls of the cells. These masses when amorphous are made up entirely of tannin and when somewhat crystalline contain an admixture of tannin and gallic acid.

III. When the winged insect has developed, (1) only a few layers of the cells of the central zone remain, and these contain a number of tannin vacuoles. Surrounding the latter are several (as many as 12) rows of prominent lignified cells. (2) The cells of the middle layer in specimens which are of this age and have been treated with copper acetate, contain numerous brownish-red tannin masses to which may be adhering some yellowish-brown crystals of gallic acid. But the tannin is in by far the greatest quantity in the cells of this layer and at this age of the galls. (3) The cells of the external layer also contain tannin masses.

*Conclusion.*—(*a*) It is well known that gallic acid occurs naturally in the nut galls (the product of *Cynips gallae tinctoriae* Olivier on *Quercus Lusitanica* Lamck.); the leaves of *Arctostaphylos Uva-ursi* (L.) Spreng., *Thea Chinensis* Sims, and of various species of *Rhus;* the fruit of *Terminalia chebula* Retzius (Myrobalans), and *Caesalpinia coriaria* Willd. (Divi-Divi); the acorn cups of *Quercus Ægilops* L. (Valonia); and may be obtained by extraction with water in the form of silky needles and asymmetric prisms. With the alkalies, alkaline earths, lead and copper salts, it forms crystalline compounds. (*b*) Tannic acid, on the other hand, is an amorphous substance and does not produce crystalline compounds with the salts mentioned. (*c*) Therefore, the crystalline compound found in the galls examined by the author is in all probability gallic acid. This appears to be formed at the expense of the starch during the chrysalis stage of the insect. With the maturing of the winged insect this is changed to tannic acid. The transformation of gallic acid into tannin appears to be one of simple condensation of two molecules of the former with the loss of one molecule of water, as follows: $2C_7H_6O_5$ (gallic acid) $= C_{14}H_{10}O_9$ (tannic acid) $+ H_2O$.—HENRY KRAEMER, *Philadelphia College of Pharmacy.*